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ABSTRACT

Factors affecting financial decisions for energy conservation projects at independent colleges and universities and methods that may be used when making a financial investment decision are examined, along with sources of funding for the projects. Projects that result in the conservation of energy resources might, in a time of extreme shortages, enable an institution to keep operating. Another factor in considering implementation of energy conservation projects concerns the recognition that there is a limited supply of resources, and investments that promote the most efficient use of those resources result in their retention. Two methods may be used when making a financial investment decision: constant dollar pricing or anticipated pricing. An illustration of an investment proposal is presented that shows the many variables that influence the cost of investment in energy-saving programs. The ideal situation for encouraging investment is a rising fuel price and a decreasing rate of return (interest). The investment decision becomes more complex when competing alternatives exist. Different energy-saving possibilities provide varying fuel savings, requiring larger or smaller investment amounts. Varying degrees of flexibility are associated with different projects. Once computations have been made to determine the feasibility of various alternatives, sources of funding, internal or external, must be found. Internally, savings resulting from energy conservation programs may be channeled back into new items of equipment or energy-saving systems. A bank loan, federal programs, and fund-raising are other alternatives. (SW)

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Financing Energy Conservation Projects at Independent Colleges and Universities

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by L. R. MORRELL

The factors affecting financial decisions for energy conservation projects in an independent institution differ little from such investment decisions in private industry. They should be based for the most part on the anticipated rate of return of invested capital. In private industry a guiding hand influences decisions along the lines of profit maximization while the independent college or university is interested in cost avoidance. The two forces in a given situation often result in the same decision.

The investment process involves two steps. The first is the financial decision as to whether or not a course of action is warranted. The second step is the selection of an income source to fund the project. One added dimension for an institution of higher education is the risk associated with the nonavailability of fuel. Thus, projects that result in the conservation of energy resources might, in a time of extreme supply shortages, enable an institution to keep operating. This could also be the case when an institution is placed on a quota by a fuel supplier. Clearly, the financial return would be very high if an institution were able to avert a closing.

It is assumed that in the event of a temporary or extended closing it would be necessary to make substantial refunds to students. At the same time, payroll and other fixed commitments would place the institution in a serious financial position. Although no one likes to contemplate such an event, the possibility does exist, and some advance planning for it would be wise. Another alternative would be a partial reduction in operations. Here, consolidation would take place through the selected use of facilities. The point is that investments in energy conservation must be seen in the light of guaranteed continuing operation even though the possibility of closing as a result of a fuel shortage may be remote.

Another factor could be called resource retention. It recognizes that society has a limited supply of resources. Thus, investments that promote the most efficient use of those resources result in their retention.

Educational institutions differ from large corporations in that they are restricted to a particular location. The corporation can relocate or expand in an area where fuel is relatively cheap. No such possibility exists for the educational institution located in a colder climate. This makes it essential to reduce energy costs, which have been escalating rapidly.

It is interesting to consider those costs on a per student basis. For example, at an independent college in the Northeast with an undergraduate enrollment of 2,600 actual and budgeted fuel costs are stated in Exhibit 1.

The above cost must be recovered as a part of the comprehensive fee. While colleges and universities are nonprofit, they do find themselves competing for students who have limited resources. Some institutions are under so much pressure that they are considering the addition of an "oil surcharge." George Washington University, for example, imposed such a fee ($100) in 1980-81 as a part of student fees. This practice risks highlighting a regional cost disadvantage.

Methodology

Two methods may be used when making a financial investment decision: constant dollar pricing or anticipated pricing. Present and future cost can be determined by multiplying current use by current price. The alternative is to project price increases over the short-term period of the investment.

At a time when prices are fluctuating mildly, constant dollar pricing is recommended. However, this is not the case with energy costs. The Organization of Petroleum Exporting Countries (OPEC) has raised the average cost of a barrel of imported crude from $14 in December 1978 to approximately $37 in February 1981.

Exhibit 1

	Actual			Budgeted
	1971-72	1978-79	1979-80	1980-81
Total Cost	$254,000	$580,000	$1,104,000	$1,288,000
Cost Per Student	$ 98	$ 223	$ 425	$ 495

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Thus, the cost per barrel has increased by $23 (or 164 percent) in 26 months. The initial major cost increase came in 1973 during the Yom Kippur War when the cost of crude increased from $3 to $12 a barrel. From that time until 1978, the dollar price rose slightly, but the declining value of the dollar actually resulted in a lowering of the real cost. In late 1978 the OPEC ministers agreed to a schedule of quarterly increases. The schedule was canceled shortly thereafter as a result of the Iranian Revolution. Meanwhile, domestic oil production has temporarily increased because of the Alaskan fields. Some additional oil has been produced from "fill-in" wells in the United States. However, an 8-12 percent rate of decline in production from older sources of oil is now expected. At the same time, price controls on oil produced in our country have been phased out, and domestic oil prices will begin to match OPEC's. Thus, the total cost of fuel oil will increase.

At the beginning of 1980, U.S. average crude oil prices were equal to $15 a barrel ($15 under foreign prices). It would thus be safe to base computations in any investment calculation on rising prices. In addition to the pricing forecast, a computation of the cost of capital must be made since dollars are to be invested. If the dollars were not invested in an energy-saving program, they could be placed in other investments that yield a market return. Such a loss, known in economics as an opportunity cost, must be considered. The projected rate of return (which can be seen as a form of interest earning) will have a strong bearing on the investment decision. In effect, the return on a fuel-saving investment must compete with the investment return available from alternatives such as Treasury notes, bonds, or money market funds. If the projected cost increases of fuel are greater than the cost of capital, the investment becomes more attractive. Interest rates and inflation move in the same direction since lenders require a premium to compensate for their loss of purchasing power over the term of the loan.

The following is an illustration of an investment proposal:

Assume that an institution is using 30,000 barrels of oil at a cost of $25 a barrel. Further assume that the cost of capital in the current market is 12 percent and that the estimated price of a barrel of oil will increase at a rate of $4 per year for three years and then stabilize. The installation of energy-saving devices is expected to save 3,000 barrels of oil per year. To achieve such savings, an expenditure of $500,000 must be made. The computations would be as shown in Exhibit 2.

As shown in Exhibit 2, as long as the price of oil continues to rise at a faster rate than the incremental return on the invested funds, the accumulated savings increase. If the price of oil stabilizes or decreases, the investment will eventually yield a negative return. In the second and third years oil prices continue to rise while the compounding return effect of the investment results in larger and larger opportunity costs. In the sixth year the oil savings are more than offset by lost investment opportunities. This is, of course, a hypothetical situation.

A decrease in the rate of return (interest) on invested funds will increase the return on the energy conservation investment, making it more attractive. Using Exhibit 2 as terms of oil prices and assuming declining interest rates, the situation described in Exhibit 3 occurs.

As Exhibit 3 shows, the savings at the end of the second year would increase to $57,200 with a decline in the rate of return (interest). This compares to a savings of $34,800 in the earlier example in which there was a constant rate of return (interest). Interest rates in today's market are extremely high, with U.S. Treasury yields the highest in history. Recently, six-month bills exceeded 16 percent. Prices and interest rates are moving in the same direction during the present period. It is im-

Exhibit 2

First Year		
3,000 barrels × $25 =	$ 75,000	(Saving)
$500,000 × 12% =	60,000	(Opportunity Cost)
Savings End of First Year	$ 15,000	
Second Year		
3,000 barrels × $29 =	$ 87,000	(Saving)
$560,000 × 12% =	67,200	(Opportunity Cost)
Second-Year Savings	$ 19,800	
Accumulated Savings	$ 34,800	
Third Year		
3,000 barrels × $33 =	$ 99,000	(Saving)
$627,200 × 12% =	75,264	(Opportunity Cost)
Third-Year Savings	$ 23,736	
Accumulated Savings	$ 58,536	
Fourth Year		
3,000 barrels × $33 =	$ 99,000	(Saving)
$702,464 × 12% =	84,296	(Opportunity Cost)
Fourth-Year Savings	$ 14,704	
Accumulated Savings	$ 73,240	
Fifth Year		
3,000 barrels × $33 =	$ 99,000	(Saving)
$786,760 × 12% =	94,411	(Opportunity Cost)
Fifth-Year Savings	$ 4,589	
Accumulated Savings	$ 77,829	
Sixth Year		
3,000 barrels × $33 =	$ 99,000	(Saving)
$881,171 × 12% =	105,741	(Opportunity Cost)
Sixth-Year Loss	$ (6,741)	
Accumulated Savings	$ 71,088	

portant to remember that the traditional laws of economics can be distorted by monopolistic operations such as OPEC.

These examples illustrate the many variables that influence the cost of investment in energy-saving programs. The ideal situation for encouraging investment is a rising fuel price and a decreasing rate of return (interest). In effect, cheap funds are used to help save expensive oil.

The investment decision becomes more complex when competing alternatives exist. Different energy-saving possibilities provide varying fuel savings, requiring larger or smaller investment amounts. Again using Exhibit 3, assume that 3,000 barrels of oil could be saved in alternative A as compared to 4,440 barrels of oil in alternative B. Alternative B, however, requires a larger cash outlay. The results are in Exhibit 4.

As shown in Exhibit 4, alternative B would yield a greater savings at the end of the school year. This is true because of a larger gain in the number of barrels of oil, whose cost is increasing at a rate faster than the rate of return (interest). However, the element of financial risk must be considered. While alternative B yields the greater saving, it requires a much larger capital outlay and carries a higher financial risk. If the price of oil dropped sharply or the rate of return (interest) increased, a much larger potential loss would be possible. The other element of risk is the time frame. Generally, the quality of an investment is reflected in the degree of certainty. The longer the payback period, the higher the degree of risk as uncertainty is extended. For example, assuming that an $800,000 investment would take 20 years to be returned through savings in oil, it is possible that low-cost solar energy might be available long before the investment is amortized or that severe oil shortages could occur. Large long-term investments based on current technology are risky because such technology could soon become obsolete.

Varying degrees of flexibility are associated with different projects. The decision maker must know the type of fuel he or she is using and the probability of its continued use. A large fuel-saving investment in an oil-burning power plant may be partially lost if it were necessary to convert to coal in the near future. As noted earlier, domestic oil from previous production sources is expected to decline by 8 to 12 percent annually. Some energy experts believe that the increased demand for natural gas must be satisfied by imports from Canada or Mexico.

The U.S. has coal-producing capacity 20 percent above consumption levels, yet coal production has many associated problems such as pollution, transportation and storage, and large-scale capital requirements.

In the area of energy savings, multiple combinations of investment decisions must be considered. No item can be handled in isolation. Using a single family dwelling as an example, storm windows may save 8 percent, ceiling insulation 12 percent, caulking 3 percent, sidewall insulation 8 percent, etc. However, when the items are combined, their total savings will not be the sum of the individual parts. Thus, the right combination must be found. Each has different cost, return, and quality factors.

While energy-saving investments can be quantified, subjective decision making is still necessary. Factors to consider include price increases, availability of various fuel supplies, technological development of new and existing systems, reliability of the system or equipment in terms of forecasted energy savings, cost of capital (interest rates), future price changes in energy savings equipment and systems, and new federal and state programs. An institution that makes no new investments in effect assumes that current investments are more attractive and that its net return is greater than any to be gained through new energy-saving systems.

Exhibit 3

First Year

3,000 barrels × $25 =	$75,000 (Saving)
$500,000 × 12% =	60,000 (Opportunity Cost)
Savings End of First Year	$15,000

Second Year

3,000 barrels × $29 =	$87,000 (Saving)
$560,000 × 8% =	44,800 (Opportunity Cost)
Second-Year Savings	$42,200
Accumulated Savings	$57,200

Exhibit 4

Alternative A		Alternative B	
First Year		First Year	
3,000 barrels × $25 =	$75,000	4,440 barrels × $25 =	$111,000
$500,000 × 12% =	60,000	$800,000 × 12% =	96,000
Savings End of First Year	$15,000	Savings End of First Year	$ 15,000
Second Year		Second Year	
3,000 barrels × $29 =	$87,000	4,440 barrels × $29 =	$128,760
$560,000 × 12% =	67,200	$896,000 × 12% =	107,520
Second-Year Savings	$19,800	Second-Year Savings	$ 21,240
Accumulated Savings	$34,800	Accumulated Savings	$ 36,240

Funding Considerations

Once computations have been made to determine the feasibility of various alternatives, sources of funding—internal or external—must be found.

Internal Financing. Internally, savings resulting from energy conservation programs may be channeled back into new items of equipment or energy savings systems. The timing of such an approach is important since the investment must be made early enough in the budget year to allow for the savings to accrue. For example, in a fiscal year budget, the energy-saving project could be completed during the summer months. A related funding source is the savings from an energy conservation

Exhibit 5

Endowment Returns/Oil Price Changes
1969/70-1978/79

Fiscal Year	Appreciation (Depreciation)	Yield	Total Return	Cumulative Return	Price Per Barrel	Increase Amount	Increase %
1969-70	(14.80)	3.95	(10.85)	(10.85)	2.19	—	—
1970-71	26.18	3.85	30.03	7.65	4.32	2.13	97
1971-72	18.17	2.63	20.80	12.49	5.17	.85	20
1972-73	1.39	2.34	3.73	10.39	5.14	(.03)	(1)
1973-74	(20.14)	2.93	(17.21)	3.71	12.24	7.10	138
1974-75	4.15	4.13	8.28	4.50	13.47	1.23	10
1975-76	0.09	3.88	3.97	4.42	12.71	(.76)	(6)
1976-77	(2.62)	4.54	1.92	4.08	13.65	.94	74
1977-78	(0.53)	5.31	4.78	4.16	14.59	.94	69
1978-79	7.34	5.81	13.15	5.06	16.68	2.09	14

Present Price	$23.15
Fuel Oil Increase 10-Year Period	$14.59/666%
Endowment Return	5.1%

program in which lower usage is achieved without capital expenditures. Unfortunately, increases in unit costs have more than offset savings from usage decreases. A board of trustees could be persuaded to reassign funds budgeted for fuel to energy saving projects, with the understanding that such a move will have little or no impact on the total operating budget.

Internal funds may be borrowed from endowment assets. When this is done, the average rate of return from all endowed assets should be used as a basis for reimbursement. It thus becomes essential that cash income savings are sufficient to enable a proper reimbursement to endowed funds. Again, the investment decision is based on the premise that the rate of return and quality of earnings (savings) from the energy saving project exceed those expected from the endowment funds. One way to argue for the above is to prepare a 10-year comparison of the rate of return of invested endowment funds and the price changes of a barrel of oil. Again using an independent college in the Northeast, the investment returns are seen in Exhibit 5.

A related possibility is the assignment of quasi-endowment for investment in the energy-saving program.

External Financing. A bank loan is one alternative although it can be expensive because of current high interest rates. Recent federal restrictions on loans will undoubtedly make such a funding source more expensive.

Federal programs are an excellent possibility as they become more available. As with any similar program, restrictions that might apply to such grants must be noted.

Another source of money is fundraising. While traditional fundraising projects often provide enrichment of academic quality through improved programs or new facilities, the gift for energy conservation projects actually yields a net return through cost savings. In effect, the gift has matching aspects since for every dollar donated a dollar or more can be saved on a continuing basis. As fuel prices increase, savings do also. The uniqueness of such a situation should be carefully set out in any proposal for funding.

The energy crisis affects everyone and has received broad national coverage. Thus, it is understood by those persons able to make gifts and award grants. Proposals to such persons should clearly describe the scope of the project, its cost, the anticipated annual savings, and the payback period. Finally, it would be wise to include several alternatives at varying funding levels. ◆